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Investigation of the depression in breast cancer patients by computational intelligence technique

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ABSTRACT

Breast cancer is one of the most common cancers in females. Depression could be occurred in patients with breast cancer. The psychiatric problem could influence on the quality of life. Treatment could be used in order to eliminate the suffering. By the way a patient could show different complaints therefore the depression could remain undetected and not treated as well. In this investigation the depression was analyzed according the different input factors. These factors are: age range, occupation status, education level, marriage status, therapy level and economic status. Computational intelligence technique was used to estimate the influence of the each factor for the depression in the breast cancer patients. Based on the results the age range and occupation status is the most dominant combination of the factors for the depression in breast cancer patients.

1. Introduction

The breast cancer diagnosis is one of the major problems in the medical field. The correct patterns classification of breast cancer is an important real-world medical problem. Breast cancer has become one of the major causes of mortality around the world and research into cancer diagnosis and treatment has become an important issue for the scientific community. Among patients with cancer, the management of depression is very important to improve quality of life. Depression, fatigue, and sleep disturbances have been identified as a symptom cluster among breast cancer patients. However, few studies have examined the temporal relations between these symptoms surrounding diagnosis and treatment.

These distressing symptoms not only affect patients at diagnosis and during cancer treatment but also persist years beyond the end of treatment. Given the growing number of breast cancer survivors and the impact of receiving a cancer diagnosis and undergoing treatment on mood and quality of life, it is important to understand cancer-related mental health symptoms to inform treatment and prevention efforts.

Chemotherapy is one of the most common treatment modalities, as it aims to reduce the tumor burden. However, patients suffer extensively from the side effects of chemotherapy, which is believed to reduce their self-efficacy to fight against the disease and hence, compromises their quality of life. In the studies (Ho, So, Leung, Lai, & Chan, 2013; Sajjad, Ali, Gul, Mateen, & Rozi, 2016; So et al., 2010) the effect of individualized patient education was aimed to be determined along with emotional support on the quality of life (of breast cancer patients undergoing chemotherapy. The purpose of paper (Zhou et al., 2015) was to examine effects of music therapy and progressive muscle relaxation training on depression, anxiety and length of hospital stay in Chinese female breast cancer patients after radical mastectomy where results showed that he music therapy and progressive muscle relaxation training can reduce depression, anxiety and length of hospital stay in female breast cancer patients after radical mastectomy. In article (Saboonchi et al., 2014) the transiency of distress response in breast cancer patients was examined by investigating the changes in clinical caseness of depression and anxiety during one year following surgery where the findings emphasize the importance of screening and follow up monitoring of distress. The aim of the study (Yagli & Ulger, 2015) was to investigate the effects of yoga on the quality of life in patients with Cancer where it was concluded that yoga is valuable in helping to diminish depression, pain, fatigue and helps cancer patients to perform daily and routine activities, and increases the quality of life in elderly patients with breast cancer. It is unclear whether breast cancer survivors have a

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Table 1
Socio-demographic characteristic of the sample and the medical status variables (Cvetković & Nenadović, 2016).

Gender (women) (n = 84)		Number of interviewees in the first group n = 50	%	Number of interviewees in the second group n = 34	%
Age (expressed in years)	30–40	13	68%	6	31%
	41–60	25	58%	18	41%
	61–78	12	54%	10	45%
Educational status	Elementary school	24	72%	9	27%
	Secondary school	16	53%	14	46%
	University	10	47%	11	52%
Marital status	Married	39	72%	15	27%
	Single	6	42%	8	57%
	Divorced	2	25%	6	75%
	Widow	3	37%	5	62%
Economic status	low	36	62%	22	37%
	middle	14	60%	19	39%
	high	0	0	3	%
Occupation status	Not active	22	44%	11	30%
	Active	17	34%	13	38%
	Retired	11	22%	10	29%

higher risk of long-term symptoms of depression or anxiety. The aim of the study (Maass, Roorda, Berendsen, Verhaak, & de Bock, 2015) was to systematically review the evidence about long-term symptoms of depression and anxiety in breast cancer survivors where it was suggested a higher prevalence of symptoms of depression among breast cancer survivors than among the general female population, persistent over more than 5 years after diagnosis. The study (Ho, Rohan, Parent, Tager, & McKinley, 2015) investigated the co-occurrence of and interrelations between nonsomatic depressive symptoms, fatigue, and sleep disturbances in breast cancer patients at three time points: before, after, and six to eight months following adjuvant chemotherapy treatment where findings supported the notion that depression, fatigue, and sleep disturbances manifest as a symptom cluster where it was found that the fatigue may precede nonsomatic symptoms of depression among premenopausal breast cancer patients and represents a potential intervention target. The study (Park, Lee, Kim, Bae, & Hahm, 2012) was shown that escitalopram may improve both quality of life and depression in breast cancer patients.

Although there were many investigations of the depression in breast cancer patients, in this study the main aim is to apply a computational intelligence technique for the depression analyzing (Jang, 1993). These factors are: age range, occupation status, education level, marriage status, therapy level and economic status. Computational intelligence technique was used to estimate the influence of the each factor for the depression in the breast cancer patients.

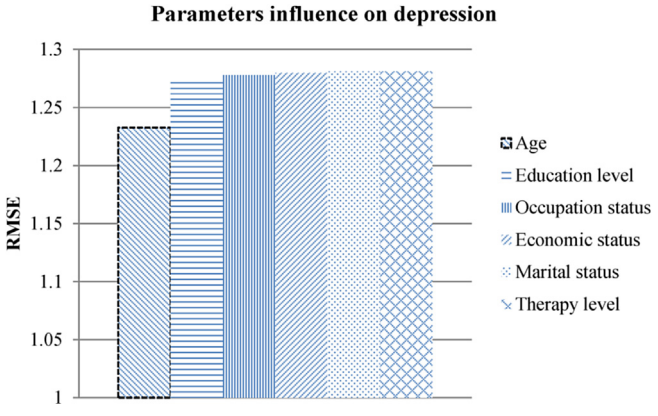

Fig. 1. RMSE values for each input separately.

2. Methodology

2.1. Depression data

The research included 87 interviewees, ages 30 to 78. From the total number of interviewees, three of them did not fill out the form properly, and were therefore excluded from further analysis, so the final statistical analysis of the sample was performed on 84 interviewees. The research was performed in the oncology outpatient ward in the Clinical Center of Niš. Patients filled out questionnaires which contained two parts: a part for filling out the socio-demographic characteristics of the patient, where the interviewees had to write their age, marital status, level of education, economic status and the number of therapy cycles (Table 1). The second part was a standardized Beck Depression Inventory (BDI) (Vredenburg, Krames, & Flett, 1985), which they filled out while they were waiting for their regular outpatient examination by their chosen specialist. The tests were handed out from March of 2013 to February 2014.

All the interviewees were members of a group which had to undergo cytotoxic treatment due to breast cancer. It was the diagnosis of breast cancer, which needs cytotoxic treatment, which was the basic criterion for including interviewees in the research.

The depression evaluation instrument was the Beck Depression Inventory (Vredenburg et al., 1985), which is a one-dimensional scale for assessing depression and holds a significant place in research due to its reliability and validity. It contains 21 questions with a possibility of grading responses on a four-degree scale from 0 to 3, where the higher values on the scale presented imply the presence of symptoms of higher intensity. The total score is calculated by a simple addition of all answers collected for the given 21 claims, and the values of the summation score range from 0 to 63, where the higher summation score points to more severe depression. Depression can be quantified by determining one of its five degrees. The results acquired are added and placed into one of the following categories: 0–13 minimal depression; 14–19 mild depression; 20–28 moderate depression; and 29–63 severe depression. The interviewees were categorized into those that suffer from depression and those that do not (Cvetković & Nenadović, 2016).

2.2. Computational intelligence

As computational intelligence technique neuro-fuzzy approach was used in this study. This approach merges neural networks and fuzzy logic as a single system. The neural network was used to